N. sylvatica Marsh. var. sylvatica **Black Tupelo** (typical)

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N. sylvatica var. biflora (Walt.) Sarg. **Swamp Tupelo**

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Black tupelo *(Nyssa sylvatica)* is divided into two commonly recognized varieties, typical black tupelo (var. *sylvatica)* and swamp tupelo (var. *biflora)*. They are usually identifiable by their differences in habitats: black tupelo on light-textured soils of uplands and stream bottoms, swamp tupelo on heavy organic or clay soils of wet bottom lands. They do intermingle in some Coastal Plain areas and in those cases are hard to differentiate. These trees have moderate growth rate and longevity and are an excellent food source for wildlife, fine honey trees, and handsome ornamentals.

BLACK TUPELO

Black tupelo *(Nyssa sylvatica* var. *sylvatica)* is also widely known as blackgum; other common names include sourgum, pepperidge, tupelo, and tupelo-gum.

Habitat

Native Range

Black tupelo (figs. 1, 2) grows in the uplands and in alluvial stream bottoms from southwestern Maine to New York, to extreme southern Ontario, central Michigan, Illinois, and central Missouri, and south to eastern Oklahoma, eastern Texas, and southern Florida. It is local in central and southern Mexico. Optimum development is made on lower slopes and terraces in the Southeastern United States.

Climate

Due to its wide distribution, black tupelo is found in a variety of climates with a wide range of temperatures. Rainfall throughout the range averages about 1270 mm (50 in) per year. In the South and Southeast, more than half of the rain falls during the growing season while in the northerly and westerly extremes of the range, substantially less than half of the rain falls during the growing period.

Soils and Topography

Black tupelo is found on a wide variety of sites from the creek bottoms of the southern coastal plains to altitudes of 910 m (3,000 ft) in North Carolina. The variety grows best on well-drained, light-textured soils on the low ridges of second bottoms and on the high flats of silty alluvium. In the uplands it grows best on the loams and clay loams of lower slopes and coves. When found on drier upper slopes and ridges, it is seldom of log size or quality *(8)*. Approximately two-thirds of the species range is dominated by soils of the order Ultisols, with Udults as the principal suborder.

Associated Forest Cover

Black tupelo is not predominant in any major forest type; however, it is a component of 35 forest cover types *(3)*. In New England it is associated with Black Ash–American Elm–Red Maple (Society of American Foresters Type 39). In the central and southern forest regions, it is found in the following types:

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ng and Pole Stages to Maturity

owth and Yield—Black tupelo can achieve ıts of 36 m (120 ft) and diameters up to 122 cm n) at breast height on the most favorable sites. ıeter growth on medium sites where the tree has stand position may reach 10 to 20 cm (4 to 5 in)) years. On poorer sites or where the tree is ded, diameter and height growth can be very *(7)*. Black tupelo growing on good sites that not been burned can produce veneer logs. Most suitable for veneer are about 50 cm (20 in) in ı. Black tupelo produces a pronounced ribbon ·e and is often quarter sliced *(6)*. The light, ›rm-textured wood of tupelo makes excellent con- ›rs. Much of the merchantable upland black lo is used for crossties and pallets. A majority of ıs are not considered desirable growing stock and often left standing following commercial timber ;. These stems are usually moderately easy to rol with herbicides.

ɔoting Habit—No information available.

eaction to Competition—Black tupelo is usual- ıund in mixture with other species. It is classed olerant of shade. Only rarely does it attain a inant crown position within its age group; it ılly occupies an intermediate crown position on t sites. Some intermediate black tupelo stems ›ond favorably to release from overtopping ›tation. Seedlings grow slowly under a fully ked stand. When the canopy is removed, about ›ercent or more can be expected to respond with tively rapid height growth. Large numbers of seedlings can become established at the time of ing.

amaging Agents—Black tupelo, particularly re it grows on dry sites, is often affected by fire. fires can cause serious mortality and cull. Fire 's often serve as entry courts for large numbers eart rot fungi. Ten of 25 black tupelo samples in udy of the central hardwood region had heart rot

he tupelo leafminer *(Antispila nysaefoliella)* and forest tent caterpillar *(Malacosoma disstria)* at- : the tupelos.

›cial Uses

ecause of its wide range, frequency of occurrence, the palatability of its fruit and sprouts, black ›lo is an important wildlife species *(4)*. The fruit, ı in crude fat, fiber, phosphorus, and calcium, are eaten by many birds and animals. Young sprouts are relished by white-tailed deer but lose palatability with age. Because it is a prolific producer of cavities, black tupelo is usually ranked as one of the more dependable den tree species. Black tupelo is a good honey tree and is often planted as an ornamental.

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SWAMP TUPELO

Swamp tupelo *(Nyssa sylvatica* var. *biflora)* is also called blackgum; another common name is swamp blackgum.

Habitat

Native Range

Swamp tupelo (fig. 3) grows chiefly in the Coastal Plains from Delaware, eastern Maryland, and southeastern Virginia, south to southern Florida and west to eastern Texas. Its range extends north up the

3—*A swamp tupelo in the lower Coastal Plain of South a.*

ssippi Valley to southern Arkansas and west outh Tennessee *(17)*.

te

imp tupelo grows in a warm humid climate. ners are long and hot; winters are short and The frost-free period ranges from 7 months in orthern area to 11 months in the South. Average temperature is 26° C (78° F). The average ary temperature varies from 2° C (35° F) in the to 18° C (65° F) in the South. Average annual pitation varies from 1020 to 1650 mm (40 to 65 nd is lowest at the northern and western edges range.

the Atlantic Coastal Plain, summer usually is st and autumn driest. Precipitation is more mly distributed along the gulf coast. Periodic ner droughts occur in the western portion of its .

Soils and Topography

Swamp tupelo grows on a variety of wet bottomland soils including organic mucks, heavy clays, and wet sands. It occurs mainly on soils in the orders Ultisols, Inceptisols, and Entisols.

Swamp tupelo not only tolerates flooding but actually thrives under those conditions *(16)*. It is seldom found on sites that are not inundated much of the growing season. Swamp tupelo grows in headwater swamps, strands, ponds, river bottoms, bays, estuaries, and low coves. Normally it does not grow in the deeper parts of swamps or overflow river bottoms.

The type of water regime is more important to growth of swamp tupelo than the soil type *(11)*. Best growth is achieved on sites where the soil is continuously saturated with very shallow moving water. Growth can be reduced as much as 50 percent when the water is stagnant, as in ponds. Intermittent flooding, with periodic drying cycles, or continuous deep flooding even by moving water, also reduces growth.

Associated Forest Cover

Swamp tupelo is a major component of the forest cover types Baldcypress–Tupelo (Society of American Foresters Type 102), Water Tupelo–Swamp Tupelo (Type 103), and Sweetbay–Swamp Tupelo–Redbay (Type 104) *(9)*. In the following cover types it is a minor component: Cabbage Palmetto (Type 74), Loblolly Pine–Hardwood (Type 82), Slash Pine (Type 84), Slash Pine–Hardwood (Type 85), Atlantic White-Cedar (Type 97), Pond Pine (Type 98), Pondcypress (Type 100), and Baldcypress (Type 101).

Other trees and shrubs commonly associated with swamp tupelo are red maple *(Acer rubrum)*, buttonbush *(Cephalanthus occidentalis)*, buckwheat-tree *(Cliftonia monophylla)*, dogwood *(Cornus* spp.), swamp cyrilla *(Cyrilla racemiflora)*, swamp-privet *(Forestiera acuminata)*, Carolina ash *(Fraxinus caroliniana)*, loblolly-bay *(Gordonia lasianthus)*, dahoon *(Ilex cassine)*, inkberry *(I. glabra)*, yaupon *(I. vomitoria)*, fetterbush lyonia *(Lyonia lucida)*, and bayberry *(Myrica* spp.).

Life History

Reproduction and Early Growth

Flowering and Fruiting—The minute greenish-white flowers appear in the spring with the leaves, usually in late April in South Carolina. Flowers are polygamo-dioecious, or swamp tupelo may bear

.aminate and pistillate flowers on separate trees :2). Insects, primarily bees, are the major pollinat- ıg vector, but pollen is also spread by wind. The ~~uit, a drupe, changes from green to a dark blue as~~ ~~ripens, usually in early November in South~~ arolina.

Seed Production and Dissemination—Most ears swamp tupelo is a prolific seed producer. Over 4-year period in a 90-year-old stand in South :arolina seed production was as follows:

Year	*Seeds/ha*	*Seeds/acre*
1963	135,900	55,000
1964	0	0
1965	1,697,600	687,000
1966	2,058,400	833,000
Average	972,970	393,750

Seed viability, which averaged 60 percent, in- reased as the season progressed. The seed crop ailure in 1964 was probably the result of a late frost.

In South Carolina seedfall begins in early Septem- ıer *(6)*. About 50 percent of the seeds are shed from ate October through November. By early December, eedfall is 90 to 95 percent complete. Dissemination s fairly uniform over an entire area. The principal lissemination agents are gravity and birds, mostly obins. The birds consume the fleshy fruits and the eeds are passed through the digestive tract. In outhern Carolina, the arrival of large flocks of nigratory robins often coincides with peak ripening. Jnder these conditions birds can disseminate about 5 percent of the total seed crop. These seeds are evenly distributed and have an average viability of 14 percent. Unlike those of water tupelo, fruits of wamp tupelo do not float.

Seedling Development—The seeds normally overwinter and germinate the following spring. Ger- nination is epigeal *(22)*. It does not take place under vater, but submerged seeds germinate once the vater subsides below the soil surface *(7)*. Germina- ion is rapid in moist, drained conditions at 21° C 70° F) and higher. After germination, seedlings must grow rapidly to keep the apex and leaves above vater, because prolonged submergence during active growth will kill them. Submergence during the dor- nant season, however, has no adverse effect.

Swamp tupelo types are stable and usually egenerate following harvest, although species such is willow (*Salix* spp.) may temporarily dominate ome cutover sites *(21)*. Initial seedling estab- ishment is related to seed production, but variation n water table is more important in most years. En- rironmental conditions under an overstory of 75 to 620 trees per hectare (30 to 250/acre) are favorable for germination and early growth *(5)*. Thus, the shel- terwood method can be used to establish seedlings. ~~Regeneration can also be accomplished by clearcut-~~ ting if it is done following a good seedfall or if, as often happens, advanced reproduction ~~is already es-~~ tablished.

Vegetative Reproduction—Stump sprouting is very common following logging *(4,12,19)*. Sprouts arise from suppressed buds and are concentrated near the top of the stump. High stumps, the normal condition since trees are usually cut above the butt swell, have many more sprouts than low-cut stumps. Harvesting trees just before the growing season can increase the growth rate of sprouts.

Stump sprouts can produce seed at 2 years of age. Thus, if the seed crop fails or if unfavorable water conditions prevent a good crop of seedlings from be- coming established, sprouts can provide a seed source. However, sprout growth is often so rapid and profuse that all competing vegetation, including natural or planted seedlings, is soon overtopped. Whether or not these sprouts develop into good quality stands is not known.

Sapling and Pole Stages to Maturity

Growth and Yield—On good sites swamp tupelo can attain heights of 37 m (120 ft) and diameters exceeding 122 cm (48 in) *(2)*. Average stand d.b.h. at age 85 is 25 cm (10 in) *(1)*. The average height of dominants at different ages is as follows:

Years	*Meters*	*Feet*
20	11	36
30	15	50
40	18	59
50	20	65
60	21	70
70	22	73
80	23	76
90	24	78
100	24	80

Pure, even-aged stands produce an average of 9 m^3/ha (1 cord/acre) per year through age 85. Repre- sentative normal yields by age and site index are given in table 1.

Rooting Habit—Swamp tupelo normally develops a taproot and has a swollen base to the mean height of the growing season water level. Water roots, which develop under flooded conditions, help support the tree and capture nutrients. These specialized roots tolerate high carbon dioxide concentrations, oxidize

: 1—Normal yield for swamp tupelo in :astern Georgia[1]

Site index at base age 50 years		
15.2 m or 50 ft	22.9 m or 75 ft	30.5 m or 100 ft
	m³/ha	
142	209	357
198	292	499
243	357	611
278	408	699
306	449	769
328	482	826
347	510	873
363	533	913
	ft³/acre	
2,030	2,980	5,105
2,835	4,170	7,135
3,470	5,100	8,725
3,965	5,830	9,980
4,365	6,415	10,980
4,690	6,890	11,795
4,960	7,290	12,475
5,185	7,620	13,045

ıble volume for trees 14 cm (5.5 in) and larger in d.b.h.

izosphere, and carry on anaerobic respiration. they are the key to the species ability to thrive flooded conditions *(14,15)*.

ıction to Competition—Swamp tupelo is d as intolerant of shade and is best suited to ıge management *(18,21)*. Although seedlings e established under an existing stand they do :velop unless released. Swamp tupelo grows ı stands with relatively high basal areas of 39 m²/ha (170 to 200 ft²/acre). Many harvested levelop sapling densities far in excess of op-.. Natural thinning in these overstocked stands e slow and, although individual trees respond nning, difficult access and damage to sites logging operations, coupled with low returns, thinning undesirable.

ıaging Agents—Swamp tupelo sites are nor- quite wet, but during extended drought they out. If the peat that accumulates on many of es becomes dry enough to burn, severe fires use high mortality and cull in the stand *(3)*. forest tent caterpillar *(Malacosoma disstria)* tes trees, reducing growth. Severe damage can in dieback and mortality *(23)*. Various wood- insects cause significant degrade in swamp veneer logs. Tupelo lesion caused by *Fusarium solani* develops on the stem, killing the cambium, which causes swelling and roughened bark (2). Although this is seldom lethal it can cause significant degrade in logs. *Fomes* spp., *Polyporus* spp., *Daedalea ambigua, Hydnum erinaceum, Lentinus tigrinus,* and *Pleurotus ostreatus* fungi all cause heartrot in swamp tupelo.

Swamp tupelo is very susceptible to sapsucker injury and is readily damaged by salt spray. Sulfate-enriched water can cause seedling mortality *(20)*.

Special Uses

The foliage and twigs of swamp tupelo are browsed by deer *(10)*. Birds and small mammals consume the fruit. The flowers are a source of nectar for bees kept by commercial honey producers. Certain locations, such as the Apalachicola River bottoms of west Florida, produce significant quantities of swamp tupelo honey.

Genetics

Tests with seedlings indicate that there are local populations that are adapted to different habitats *(13)*. The three habitats identified were blackwater rivers, headwater swamps, and ponds.

A shrubby form of swamp tupelo found in the panhandle of Florida may be a local race. Some authors *(8)* consider swamp tupelo a separate species *(Nyssa biflora)* rather than a variety of black tupelo *(N. sylvatica* var. *sylvatica)*, while others suggest it is a variety which will hybridize with black tupelo.

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